

**CHAPTER 3.9**  
**COVER SOIL LAYER**

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### **CHAPTER 3.9 COVER SOIL LAYER**

3.9-1. **GENERAL.** This chapter lists QA responsibilities during placement of cover soil above geosynthetics. Placement of cover soil is a critical step since the underlying geosynthetic materials are relatively thin layers which can be easily damaged. In a liner system, the cover soil will typically consist of a drainage layer or a clay barrier layer. Cover soil placed above geosynthetic layers in a landfill cover is commonly referred to as select fill. In addition to protection of geosynthetics, the select fill layer also protects the low-permeability clay layer from freezing temperatures and desiccation. The select fill layer in a landfill cover should be composed of soil that is capable of sustaining a vegetative cover throughout dry periods. The select fill also provides water holding capacity to slow down rainfall infiltration to the drainage layer.

The type of soil used for select fill is a site specific decision. Typically, select fill will consist of medium-textured soils for both function and constructibility. Cohesionless silts and sands are undesirable because these soils have low water retention capacity and nutrients are easily leached from them. However, high plasticity clays can damage underlying geosynthetics during placement. The best materials are usually cohesive but not highly plastic. Consult the specifications for the soil type that has been deemed "suitable" by the designer.

The maximum particle size specified for select fill will typically range from 12.5 to 25 mm (0.5 to 1 inch) depending on the type of geosynthetics present beneath the select fill. The use of angular material should also be avoided because of increased potential for damaging geosynthetics.

The select fill layer (including topsoil) should generally be a minimum of 600 mm (24 inches) thick or equal to the maximum frost depth, whichever is greater.

a. **Equipment.** Verify that the equipment used to place the cover soil is in accordance with the specifications. Contact the designer if equipment requirements for cover soil placement are not discussed in the specifications. The following paragraphs provide general guidance on equipment requirements.

(1) Equipment should not be allowed to travel directly on top of geosynthetics. This includes cars and light trucks.

(2) Check the specifications to see if all terrain vehicles (ATV) with low ground pressure tires can be operated on top of the geosynthetics. If ATVs are allowed to operate on top of the geosynthetics, they should move at a slow rate of speed, travel in straight lines or large arcs, not start or brake abruptly, and not turn sharply. Refueling should be performed outside the limits of the liner or cover system.

(3) Tracked equipment with a ground pressure of less than 35 kPa (5 psi) should be used to spread the first lift of cover soil.

(4) The required cover soil thickness needed to allow safe operation of full scale construction equipment is site specific and depends on the type of geosynthetics being covered, the cover soil type, and the subgrade. Contact the design engineer if the specifications do not indicate the minimum thickness of the cover soil layer prior to allowing operation of full scale construction equipment.

b. Preconstruction Submittals. The contractor should provide preconstruction submittals as required by the specifications. The following is a list of typical submittal requirements.

(1) Borrow Source Assessment Report for the cover soil.

(2) Chemical contamination test results to verify the borrow is not contaminated.

c. Construction Submittals. The contractor should provide construction submittals as required by the specifications. The following is a list of typical submittal requirements.

(1) Borrow source classification test results.

(2) In-place moisture content and density test results.

d. Weather Limitations.

(1) In general, backfilling in warm climates or during summer months should be performed during the coolest part of the day to minimize wrinkles in geomembranes.

(2) In extreme cases, of excessively high temperatures, backfilling may need to be performed during non-typical work hours, e.g., sunrise to 10:00 AM or 5:00 PM to sunset.

(3) If cover soil placement is performed at night, ensure the contractor is using adequate lighting to safely work.

### 3.9-2. PRODUCTS.

Cover Soil. Verify cover soil borrow source assessment testing has been performed. Ensure the proposed cover soil meets the specified requirements for grain size distribution, Atterberg limits, maximum particle size, and all other physical properties specified.

(1) Periodic classification testing should be performed on the borrow as it is excavated during construction. Check borrow test results (sieve analysis and Atterberg limits) to verify that the material meets the specified requirements. Require additional classification testing if the properties of the borrow source appear to be changing.

(2) Perform daily inspections of the cover soil to see if there are visible changes in the properties of the borrow. Carefully inspect for oversize particles.

### 3.9-3. EXECUTION.

a. Installation.

(1) A QA Representative should be present at all times during backfilling over the geosynthetics. Check the specifications to determine the maximum allowable exposure time for the deployed geosynthetics prior to covering.

(2) Ensure placement of cover soil proceeds from a stable working area adjacent to the deployed geosynthetic material and gradually progresses outward. For slopes, cover soil should be

placed by starting at the toe and working up the slope.

(3) Cover soil should be pushed forward in an upward tumbling motion using a bulldozer or front end loader.

(4) Cover soil should not be dumped or dropped directly onto the underlying geosynthetic material from a height greater than 1 meter (3 feet).

(5) The contractor should be allowed to place access routes over the geosynthetics to speed up cover soil placement. The access routes will allow use of larger construction equipment to carry cover soil out onto the geosynthetic layers. Cover soil thickness for access routes will generally be a minimum of 900 mm (3 feet).

(a) Tracks and wheels of full-scale construction equipment must remain on the access routes at all times.

(b) Inspect access routes daily to see if thinning of the cover soil is occurring. The contractor should be required to repair any areas of the access route which are thinning.

(6) Verify that the cover soil lift thicknesses are in accordance with the specifications. Typically, the first lift of cover soil is a minimum 200-mm (8-inches) to 300-mm (12-inches) in thickness.

(7) Do not allow large stockpiles of cover soil to be placed on the underlying geosynthetic materials.

(8) Carefully inspect placement and compaction of soil placed above geosynthetic layers. Look for slippage of the compaction equipment on slopes. This can cause damage to the geosynthetics.

(9) Look for thin areas of cover soil which could allow the geosynthetics to be punctured or torn by construction equipment.

(10) Do not allow compaction equipment to be operated at speeds exceeding specified limits (generally 2.2 meters per second (5.0 miles per hour)).

(11) Watch for construction equipment braking suddenly while on top of the cover soil.

(12) Do not allow wrinkles in the geosynthetic layers which fold over onto themselves. To help prevent wrinkles, fingers of backfill are sometimes pushed out over the geosynthetics with controlled amounts of geosynthetic slack between the fingers.

(13) Penetrations.

(a) Verify that soil placed around penetrations does not contain voids and is adequately compacted.

(b) Inspect pipes which penetrate the cover soil layer for damage due to compaction equipment.

(14) Verify the cover soil layer is placed to the lines and grades shown on the drawings.

(15) Verify the final lines and grades of the cover soil layer are correct.

b. Compaction. Both method and performance specifications have been used to place cover soil layers. Compaction requirements are usually waived for the first lift of cover soil placed above geosynthetic layers.

(1) Method Specification.

(a) Verify the correct size and type of equipment is being used to compact the cover soil layer.

(b) Periodically check that the contractor is making the required number of passes to compact all areas of the cover soil layer.

(2) Performance Specification. Verify the cover soil is placed and compacted within the specified moisture content and density ranges. Verify moisture content and density tests are performed using specified test procedures on each lift of cover soil. Refer to Chapter 3.3 Low Permeability Clay Layer for a description of moisture and density testing procedures.

c. Repairs. If the cover soil layer does not conform to the specifications, the first step is to define the extent of the area requiring repair.

(1) Require the contractor to repair the lift of cover soil out to the limits defined by passing QC or QA tests.

(2) Do not allow the contractor to guess at the extent of the area that requires repair. Additional tests are often required to define the area requiring repair.

(3) After repairs have been made, the repaired areas should be tested at the same frequency as required for the rest of the project.

d. Protection.

(1) Require excess moisture to be removed from the surface of the cover soil layer prior to placement of additional fill.

(2) Look for areas of erosion after each rainfall. Also look for tire ruts and other thin areas in the cover soil layer. Require the contractor to repair these damaged areas and reestablish grades.

(3) Do not allow the placement of stockpiles on top of the completed cover soil layer.